TRIODE-OUTPUT PENTODE

The triode section is intended for use as A.F. amplifier.
The pentode section is intended for use as A.F. power amplifier.

QUICK REFERENCE DATA

Triode section			
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-
Pentode section			
Anode current	I_a	41	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Output power	W_o	3.3	W

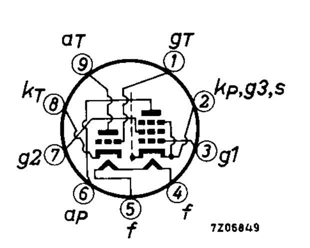
HEATING: Indirect by A.C. or D.C.; series supply

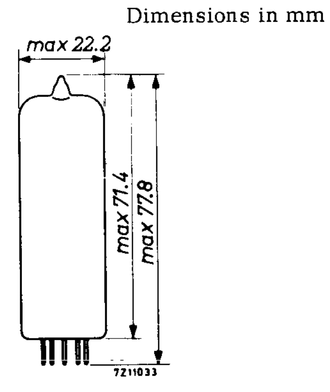
Heater current	I_f	100	mA
Heater voltage	V_f	50	V

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval





CAPACITANCES

Triode section

Anode to all except grid	$C_{a(g)}$		4.3	pF
Grid to all except anode	$C_{g(a)}$		2.7	pF
Anode to grid	C_{ag}		4.4	pF
Grid to heater	C_{gf}	max.	0.02	pF

Pentode section

Anode to all except grid No.1	$C_{a(g_1)}$		8.0	pF
Grid No.1 to all except anode	$C_{g_1(a)}$		9.3	pF
Anode to grid No.1	C_{ag_1}	max.	0.3	pF
Grid No.1 to heater	C_{g_1f}	max.	0.3	pF

Between triode and pentode sections

Anode triode to grid No.1 pentode	$C_{a_Tg_{1P}}$	max.	0.02	pF
Grid triode to anode pentode	$C_{g_Ta_P}$	max.	0.02	pF
Grid triode to grid No.1 pentode	$C_{g_Tg_{1P}}$	max.	0.025	pF
Anode triode to anode pentode	$C_{a_Ta_P}$	max.	0.25	pF

TYPICAL CHARACTERISTICS

Triode section

Anode voltage	V_a	100	V
Grid voltage	V_g	0	V
Anode current	I_a	3.5	mA
Transconductance	S	2.2	mA/V
Amplification factor	μ	70	-

Pentode section

Anode voltage	V_a	170	V
Grid No.2 voltage	V_{g_2}	170	V
Grid No.1 voltage	V_{g_1}	-11.5	V
Anode current	I_a	41	mA
Grid No.2 current	I_{g_2}	9	mA
Transconductance	S	7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	9.5	-
Internal resistance	R_i	16	kΩ

OPERATING CHARACTERISTICS

Triode section as A.F. amplifier

A) Signal source resistance	R_S	0.22		MΩ
Grid resistor	R_g	3		MΩ
Grid resistor of next stage	R_g'	0.68		MΩ
Supply voltage	V_b	170	100	V
Cathode resistor	R_k	2.7	2.7	kΩ
Anode resistor	R_a	220	220	kΩ
Anode current	I_a	0.43	0.23	mA
Voltage gain	V_o/V_i [1]	51	47	-
Max. output voltage	$V_{o\,max}$	25	15	V_{RMS}
Distortion	d_{tot} [2]	2.3	4.0	%

B) Signal source resistance	R_S	0.22				MΩ
Grid resistor	R_g	22				MΩ
Grid resistor of next stage	R_g	0.68				MΩ
Supply voltage	V_b	170	170	100	100	V
Cathode resistor	R_k	0	0	0	0	Ω
Anode resistor	R_a	100	220	100	220	kΩ
Anode current	I_a	0.86	0.50	0.37	0.22	mA
Voltage gain	V_o/V_i [1]	49	53	42	46	-
Max. output voltage	$V_{o\,max}$	19	20	8	9	V_{RMS}
Distortion	d_{tot}	1.4 [3]	1.4 [3]	1.3 [2]	1.5 [2]	%

Microphony and hum

The triode section can be used without special precautions against microphony and hum in circuits in which an input voltage of minimum 10 mV$_{RMS}$ is required for an output of 50 mW of the output stage, Z_g (f = 50 Hz) = 0.25 MΩ and without A.C. voltage between pin 4 and cathode.

[1]) Measured at small input voltage.
[2]) At lower output voltages the distortion is proportionally lower.
[3]) At lower output voltages down to 5 V_{RMS} the distortion is approximately constant. At values below 5 V_{RMS} the distortion is approximately proportional to V_o.

OPERATING CHARACTERISTICS

Pentode section

Class A (Measured with V_k constant)

Supply voltage	$V_{ba} = V_{bg_2}$	100			170			V
Cathode resistor	R_k	170			200			Ω
Load resistance	$R_{a\sim}$	3.0			3.25			kΩ
Grid No.1 driving voltage	V_i	0	0.7	3.75	0	0.61	5.9	V_{RMS}
Anode current	I_a	26	-	27	42	-	44	mA
Grid No.2 current	I_{g_2}	5.8	-	8.6	9.2	-	15.5	mA
Output power	W_o	0	0.05	1.0	0	0.05	3.2	W
Distortion	d_{tot}	-	-	10	-	-	10	%

Supply voltage	$V_{ba} = V_{bg_2}$	200			V
Grid No.2 series resistor (non-decoupled)	R_{g_2}	470			Ω
Cathode resistor	R_k	330			Ω
Load resistance	$R_{a\sim}$	4.5			kΩ
Grid No.1 driving voltage	V_i	0	0.66	6.7	V_{RMS}
Anode current	I_a	35	-	37	mA
Grid No.2 current	I_{g_2}	7.8	-	13.3	mA
Output power	W_o	0	0.05	3.3	W
Distortion	d_{tot}	-	-	10	%

LIMITING VALUES (Design centre rating system)

Triode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Anode dissipation	W_a	max.	1	W
Cathode current	I_k	max.	15	mA
Grid resistor				
for fixed bias	R_g	max.	1	MΩ
for automatic bias	R_g	max.	3	MΩ
Grid impedance at 50 Hz	Z_g	max.	0.5	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V

Pentode section

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	250	V
Grid No. 2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	250	V
Anode dissipation	W_a	max.	7	W
Grid No. 2 dissipation				
average	W_{g_2}	max.	2	W
peak	$W_{g_{2p}}$	max.	3.2	W
Cathode current	I_k	max.	50	mA
Grid No. 1 resistor				
for fixed bias	R_{g_1}	max.	1	MΩ
for automatic bias	R_{g_1}	max.	2	MΩ
Cathode to heater voltage	V_{kf}	max.	200	V



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6	FP	1999.07.29